

Listing of Claims:

1. (Currently Amended) A drop ejection device, comprising: a flow path in which fluid is pressurized to eject drops from a nozzle opening on a surface, a piezoelectric actuator for pressurizing said fluid, and one or more waste fluid control apertures on the surface proximate the nozzle opening, the one or more apertures being in communication with a vacuum source.
2. (Original) The device of claim 1 including fluid control apertures which are spaced from the nozzle opening by about 200% of the nozzle opening width or less.
3. (Original) The device of claim 1 including fluid control apertures which are spaced from the nozzle opening by about 200% to about 1000% of the nozzle opening width or less.
4. (Original) The device of claim 1 wherein the control apertures are in communication with the flow path in which fluid is pressurized.
5. (Original) The device of claim 1 wherein each control aperture has a fluid resistance of about 25 times or more than the fluidic resistance of the nozzle opening.
6. (Original) The device of claim 1 wherein the average total flow through the apertures is about 10% or less than the average flow through the nozzle opening.
7. (Original) The device of claim 1 wherein each aperture has a width of about 30% or less than the width of the nozzle opening.
8. (Original) The device of claim 1 wherein the width of the nozzle opening is about 200 microns or less.
9. (Original) The device of claim 1 wherein each control aperture has a diameter of about 10 microns or less.

10. (Original) The device of claim 1 including a nonwetting coating proximate the nozzle opening.
11. (Original) The device of claim 1 wherein the flow path, nozzle opening, and control aperture are defined in common body.
12. (Original) The device of claim 11 wherein the body is a silicon material.
- 13.- 15. (Canceled)
16. (Original) A drop ejection device, comprising:
 - a flow path in which fluid is pressurized to eject drops from a nozzle opening,
 - a piezoelectric actuator, and
 - one or more fluid control apertures, the fluid control apertures being spaced from the nozzle opening by a distance of about 200% of the nozzle opening width or less, and each aperture having an aperture width of about 30% or less than the width of the nozzle opening.
17. (Original) The device of claim 16 includes at least three apertures.
18. (Original) The device of claim 16 including a nonwetting coating adjacent the nozzle opening.
19. (Canceled)
20. (Original) The device of claim 16 wherein the flow path, nozzle opening, and control aperture are defined in common body.
- 21.- 22.(Canceled)

23. (Original) A method of ejecting fluid, comprising:

providing a fluid drop ejection apparatus including a nozzle opening and at least one waste fluid control aperture, the waste fluid control aperture in communication with a vacuum,
ejecting fluid at a frequency of about 10 KHZ or greater, and
drawing waste fluid through said aperture in an amount of about 5% or less of the fluid ejected at an operating vacuum of about 5 inches of water or less.

24. (Original) The method of claim 23 including at least three apertures.

25. (Original) The method of claim 23 comprising drawing about 2% of fluid ejected at about 2 inches of water or less.

26. (Original) The method of claim 23 wherein the control aperture and the nozzle opening are in communication with a common fluid supply and the fluid supply and the vacuum are communicated through said fluid supply.

27. (Original) The method of claim 23 wherein the control aperture is about 30% or less the diameter of the nozzle opening.

28. (Original) The method of claim 23 wherein the diameter of the nozzle opening is about 200 microns or less.

29. – 33. (Canceled)

34. (New) The drop ejection device of claim 1, wherein a first body defines the nozzle opening, a second body defines the one or more apertures, and the first body is joined to the second body.

35. (New) A drop ejection device, comprising: a flow path in which fluid is pressurized to eject drops from a nozzle opening, a piezoelectric actuator for pressurizing said fluid, and one or more waste fluid control apertures proximate the nozzle opening, the one or more apertures being in communication with a vacuum source during operation of the piezoelectric actuator.

36. (New) The drop ejection device of claim 35 including fluid control apertures which are spaced from the nozzle opening by about 200% of the nozzle opening width or less.

37. (New) The drop ejection device of claim 35 including fluid control apertures which are spaced from the nozzle opening by about 200% to about 1000% of the nozzle opening width or less.

38. (New) The drop ejection device of claim 35 wherein the control apertures are in communication with the flow path in which fluid is pressurized.

39. (New) The drop ejection device of claim 35 wherein each control aperture has a fluid resistance of about 25 times or more than the fluidic resistance of the nozzle opening.

40. (New) The drop ejection device of claim 35 wherein the average total flow through the apertures is about 10% or less than the average flow through the nozzle opening.

41. (New) The drop ejection device of claim 35 wherein each aperture has a width of about 30% or less than the width of the nozzle opening.

42. (New) The drop ejection device of claim 35 wherein each control aperture has a diameter of about 10 microns or less.

43. (New) The drop ejection device of claim 35 wherein the nozzle opening and control aperture are defined in common body.

Applicants : Paul A. Hoisington et al.
Serial No. : 10/749,829
Filed : December 30, 2003
Page : 6 of 8

Attorney's Docket No.: 09991-148001

44. (New) The drop ejection device of claim 35, wherein a first body defines the nozzle opening, a second body defines the one or more apertures, and the first body is joined to the second body.